

What is claimed is:

1. A fuel cell system comprising:
  - a fuel cell working to produce an electrical energy arising
  - 5 from chemical reaction of hydrogen with oxygen;
  - a hydrogen supply device working to supply hydrogen to said fuel cell;
  - a hydrogen line through which the hydrogen is supplied from said hydrogen supply device to said fuel cell;
  - 10 an air supply device working to supply air to said fuel cell;
  - an air line through which the air is supplied from said air supply device to said fuel cell; and
  - a fluid pump driven by energy of the air flowing through said air line to suck a fluid in said hydrogen line.
- 15 2. A fuel cell system as set forth in claim 1, wherein said air line includes an air supply line through which the air is supplied from said air supply device to said fuel cell and an air drain line through which the air emitted from said fuel cell is discharged outside the
- 20 fuel cell system, and wherein said fluid pump is driven by the energy of the air flowing through the air drain line.
3. A fuel cell system as set forth in claim 1, wherein said fluid pump is implemented by an ejector pump, wherein said air line
- 25 includes an air supply line through which the air is supplied from said air supply device to said fuel cell and an air drain line through

which the air emitted from said fuel cell is discharged outside the fuel cell system, the air supply line having two branches, and wherein said ejector pump is installed in one of the two branches.

5     4.     A fuel cell system as set forth in claim 3, wherein said hydrogen line includes a suction line connecting to a suction port of said ejector pump.

10     5.     A fuel cell system as set forth in claim 4, further comprising a suction line on-off valve installed in the suction line which works to open and close the suction line selectively.

15     6.     A fuel cell system as set forth in claim 3, further comprising a three-way directional control valve installed in a junction of the branches of said air supply line which works to establish a flow of the air outputted from said air supply device to a selected one of the branches of the air supply line.

20     7.     A fuel cell system as set forth in claim 2, wherein said fluid pump is implemented by an ejector pump, further comprising a suction line extending from said hydrogen line to a suction port of said ejector pump, and wherein the fluid in said hydrogen line is drained outside the fuel cell system through said suction line and said air drain line.

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8.     A fuel cell system as set forth in claim 7, wherein said air

drain line has two branches, and wherein said ejector pump is installed in one of the two branches.

9. A fuel cell system as set forth in claim 8, further comprising a  
5 three-way directional control valve installed in a junction of the  
branches of said air drain line which works to establish a flow of the  
air outputted from said fuel cell a selected one of the branches of the  
air drain line.

10 10. A fuel cell system as set forth in claim 7, further comprising a  
vacuum tank working to store a negative pressure produced by said  
ejector pump and two suction line on-off valves installed in said  
suction line which works to open and close said suction line  
selectively, and wherein said vacuum tank is disposed between the  
15 suction line on-off valves.

11. A fuel cell system as set forth in claim 1, further comprising  
an off-gas circulation line working to circulate an off-gas, which is  
emitted from said fuel cell and contains an unreacted hydrogen gas  
20 not subjected to the chemical reaction, in said hydrogen line to  
supply the off-gas to said fuel cell.

12. A fuel cell system comprising:  
a fuel cell working to produce an electrical energy arising  
25 from chemical reaction of hydrogen with oxygen;  
a hydrogen supply device working to supply hydrogen to said

fuel cell;

a hydrogen line through which the hydrogen is supplied from said hydrogen supply device to said fuel cell;

an air supply device working to supply air to said fuel cell;

5 an air line through which the air is supplied from said air supply device to said fuel cell;

a fluid pump driven by energy of a fluid flowing through one of said hydrogen line and the air line to produce a negative pressure; and

10 a vacuum tank storing therein the negative pressure produced by said fluid pump which is used to suck the fluid in the hydrogen line.

13. A fuel cell system as set forth in claim 12, wherein said air  
15 line includes an air supply line through which the air is supplied from said air supply device to said fuel cell and an air drain line through which the air emitted from said fuel cell is discharged outside the fuel cell system, and wherein said fluid pump is driven by the energy of the air flowing through the air drain line.

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14. A fuel cell system as set forth in claim 12, wherein said hydrogen line includes a hydrogen supply line for supplying the hydrogen from said hydrogen supply device to said fuel cell and an off-gas circulation line for circulating an off-gas, which is emitted  
25 from said fuel cell and contains an unreacted hydrogen gas not subjected to the chemical reaction, in said hydrogen line to supply

the off-gas to said fuel cell, further comprising an off-gas drain line extending from said off-gas circulation line for draining the fluid in the hydrogen line outside the fuel cell system and two off-gas drain line on-off valves installed in said off-gas drain line to open and close the off-gas drain line selectively, and wherein said vacuum tank is installed between the off-gas drain line on-off valves.

15. A fuel cell system as set forth in claim 14, wherein said fluid pump is implemented by a circulation ejector pump which is installed in said hydrogen supply line and works to circulate the off-gas in said off-gas circulation line and to mix the off-gas with the hydrogen supplied from said hydrogen supply device to said fuel cell, and wherein said off-gas drain line and said off-gas circulation line are so provided as to establish fluid communication with a suction port of said circulation ejector pump selectively.

16. A fuel cell system as set forth in claim 15, further comprising an off-gas circulation line on-off valve which is installed in a portion of said off-gas circulation line located upstream of a junction of said off-gas circulation line and said off-gas drain line and works to open and close the off-gas circulation line selectively, and wherein one of the off-gas drain line on-off valves located upstream of said vacuum tank and the off-gas circulation line on-off valve are controlled to be opened and closed selectively.

17. A fuel cell system as set forth in claim 14, further comprising

a circulation ejector pump which is installed in said hydrogen supply line and works to circulate the off-gas in said off-gas circulation line and to mix the off-gas with the hydrogen supplied from said hydrogen supply device to said fuel cell, and wherein said  
5 fluid pump is implemented by an ejector pump located upstream of said circulation ejector pump in said hydrogen supply line.

18. A fuel cell system as set forth in claim 12, wherein said hydrogen line includes a hydrogen supply line for supplying the  
10 hydrogen from said hydrogen supply device to said fuel cell and an off-gas circulation line for circulating an off-gas, which is emitted from said fuel cell and contains an unreacted hydrogen gas not subjected to the chemical reaction, in said hydrogen line to supply the off-gas to said fuel cell, wherein said fluid pump is implemented  
15 by an ejector pump which is installed in said hydrogen supply line and works to circulate the off-gas in said off-gas circulation line and to mix the off-gas with the hydrogen supplied from said hydrogen supply device to said fuel cell, further comprising an off-gas drain line for draining the fluid in the hydrogen line outside the fuel cell system and two off-gas drain line on-off valves installed in said  
20 off-gas drain line to open and close the off-gas drain line selectively, wherein said vacuum tank is installed between the off-gas drain line on-off valves, and wherein said circulation ejector pump has a first suction port and a second suction port, the first suction port  
25 connecting with said off-gas circulation line, the second suction port connecting with said off-gas drain line.

19. A fuel cell system as set forth in claim 13, wherein said fluid pump is implemented by an ejector pump, further comprising a suction line extending from said hydrogen line to a suction port of  
5 said ejector pump, and wherein the fluid in said hydrogen line is drained outside the fuel cell system through said suction line and  
said air drain line.

20. A fuel cell system as set forth in claim 19, wherein said air  
10 drain line has two branches, and wherein said ejector pump is installed in one of the two branches.

21. A fuel cell system as set forth in claim 20, further comprising a three-way directional control valve installed in a junction of the  
15 branches of said air drain line which works to establish a flow of the air outputted from said fuel cell a selected one of the branches of the air drain line.

22. A fuel cell system as set forth in claim 19, further comprising  
20 a vacuum tank working to store a negative pressure produced by said ejector pump and two suction line on-off valves installed in said suction line which works to open and close said suction line selectively, and wherein said vacuum tank is disposed between the suction line on-off valves.

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23. A fuel cell system as set forth in claim 12, further comprising

an off-gas circulation line working to circulate an off-gas, which is emitted from said fuel cell and contains an unreacted hydrogen gas not subjected to the chemical reaction, in said hydrogen line to supply the off-gas to said fuel cell.